Fake Volumes and the trials and tribulations of working on FLUGG

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Concept

- Problem: interactions in the air upstream of the target cause `stuprf` to be called before `fluscw` and leave the `Nimpwt` uninitialized
- Insert a non-physical volume within which the beam particles originate but quickly exit to induce an early boundary crossing triggering a call to `fluscw`
- Additionally perform some cross check that particles are starting within the new volume
  - the geometry placement and the setting of the beam origin are not tightly coupled (geometry building code that doesn't have access to fluka data card settings)
- All so easy enough in principle...

Components

- fluscw.f
  - separate trigger of first call for a new beam particle from recording initial target info (proton[x|y|z] protonp[x|y|z])
    - if(ij.eq.1.and.ENDIN.and..not.STARTIN.and.NCASE.ne.levt) then
    - if(ij.eq.1.and.NCASE.ne.levt) then
  - also initialize `lrun` from `$RUN`
- NumiDataInput.[cc|hh]
  - default placement & size parameter; mechanism for overriding via shell variables
- NumiDetectorConstruction.cc
  - actual G4 Geometry ctor of shape & volume
  - communicate settings to fortran (`soevsv`) via common block
- soevsv.f
  - overrides default fluka routine
  - checks starting position is in the volume

More Components

- g4numi_flukaMat_[helium|shield].inp
  - `ASSIGNMAT` card to map new volume to a material
- mgdraw.f
  - use `NCASE` rather than `evtno(iNu)` for `evtno` in ntuple

Implementation

- 2103-12-02: had a proof of concept and preliminary runs that seemed to indicate that it worked
- 2013-12-03: attempted to demonstrate a completely clean implementation starting from basics (flugg tar file + direct checkout from a CVS code repository)
- Followed by 10 days of head banging as jobs (with and w/o the changes) failed due to log files filled with "Magnew" error messages
  - same failure mode that was seen when we tried gcc 4.1

Key Points

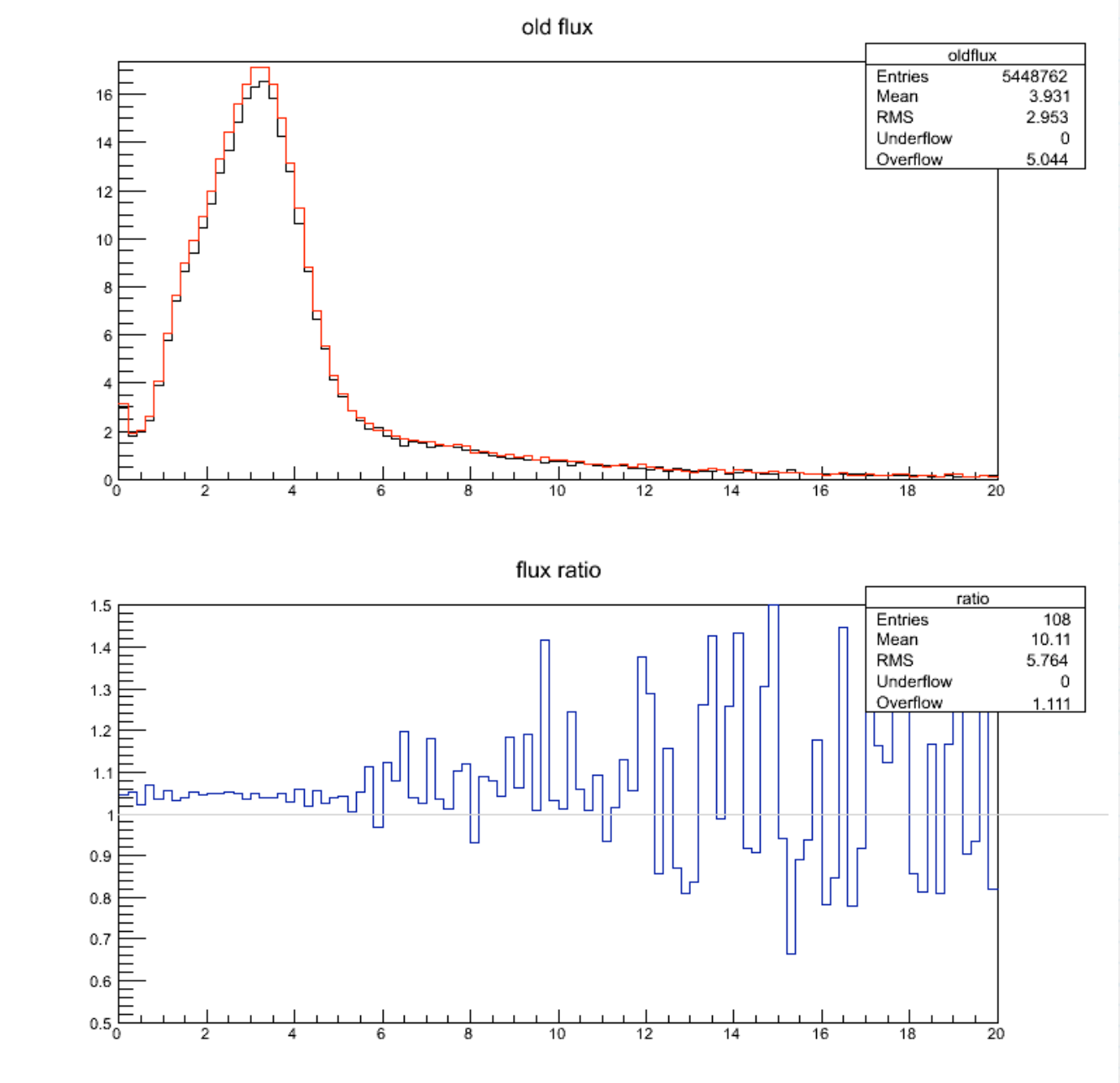
- Yes, I was using gcc 3.4.3 -
  - hacked GNUMakefile and scripts to check
- The flugg_2009_4.tar.gz is what is suggested on the fluka website, but only flugg_2009_3.tar.gz works
    - reverting to _3 is what made the Magnew errors go away
- Confusion about G4 source under /grid/fermiapp/nusoft/products/prd/geant4/4.9.3/
  - Linux+2.6-GCC_3_4_3/geant4.9.3.p02 is what it says
  - Linux+2.6-GCC_3_4 is actually g4.9.2 source

Results

- Fix the Nimpwt issue?
  - new 5704764 entries; 19 w/ Nimpwt=0
  - old 5477427 entries; 28665 w/ Nimpwt=0
- this small number is roughly consistent w/ scattering in the traversal of 0.1cm in the fake volume
  - can make the disk thinner
- run is set in file ! ... mostly ... some ==0
- evtno is never zero in file !

Results

- Fix ?
-


old flux
oldflux
Entries 5448762
Mean 3.931
RMS 2.953
Underflow 0
Overflow 5.044
flux ratio
ratio
Entries 108
Mean 10.11
RMS 5.764
Underflow 0
Overflow 1.111